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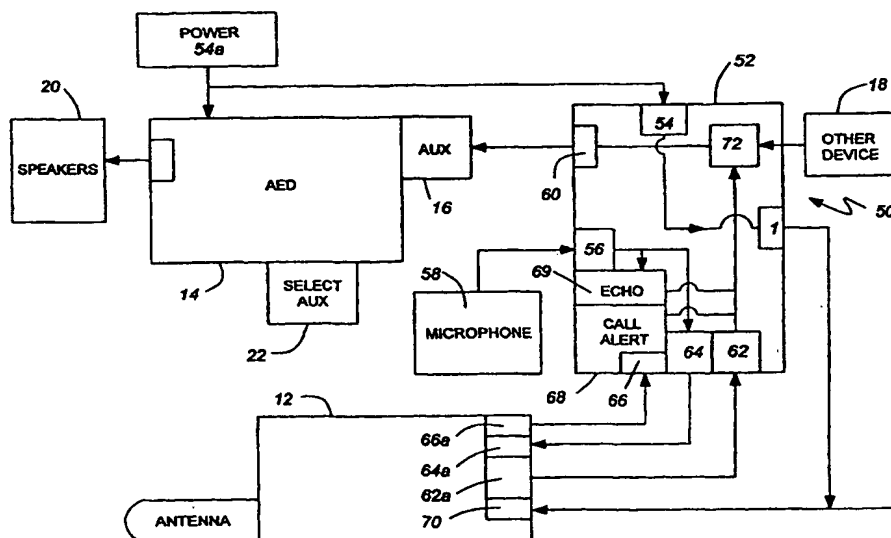
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(54) Title: SYSTEM ENABLING TELEPHONE COMMUNICATIONS THROUGH AN AUDIO EQUIPMENT DEVICE



## (57) Abstract

An interface module (52) for operative connection between a car radio (14) and a cell phone (12) to enable use of the cell phone through the car radio, the interface module comprising: audio input interface (66) for receiving an audio signal from the cell phone; audio output interface (60) operatively connected to the audio input interface for delivering the audio signal to an auxiliary port of the car radio; microphone input interface (56) operatively connected to a microphone output interface for receiving a microphone signal from an auxiliary microphone (58), the microphone output interface for delivering the microphone signal to the cell phone; and, a call alert processor (68) operatively connected to the audio input interface to alert a user to an incoming call.

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## SYSTEM ENABLING TELEPHONE COMMUNICATIONS THROUGH AN AUDIO EQUIPMENT DEVICE

***Field of the Invention***

An interfacing system is described enabling radio communication through an audio equipment device (AED). The system provides an interface module which connects a radio transceiver with an AED allowing operation of the transceiver through the AED.

***Background of the Invention***

Consumer electronics products are numerous and widespread in use and functionality. Products such as televisions, radios, cassette players, compact disk players, cellular telephones, home phone systems, video cameras and computers are purchased in large numbers each year. When purchasing such a product, a consumer purchases the product to perform a specific function or a limited range of functions. While each product may have a number of elements common to other products such as speakers, microphones, input and display systems, separate products are purchased for the primary function of the product.

In recent years, there has specifically been a large increase in the use of radio products, both receiver and transceiver products, but primarily transceiver products such as cellular phones.

The cellular phone has become a highly valuable business and personal tool enabling the user of the phone to communicate at all times of the day within a cell phone network. The cellular phone provides the convenience of being able to communicate during various activities while travelling including use within cars, while walking as well as many other activities.

With particular reference to the use of a cell phone in a car, the use of hand-held cellular phones has become a significant safety concern as a driver's attention may be diverted and/or compromised while activating the phone and/or talking on the phone. Accordingly, numerous "hands-free" systems have been developed to address the problems of driving while using a cell phone.

Typical hands-free systems utilize auxiliary speaker systems to broadcast the audio signal

from the phone to the interior of the vehicle. However, such systems are inherently inefficient often duplicating components which already exist within a vehicle which thereby lead to increased costs to the consumer.

More particularly, within most cars, a radio/stereo system is present, with the radio/stereo system having speakers for the delivery of sound to the interior of the vehicle. Accordingly, in order to address the problem of enabling a cellular phone to be effectively and efficiently used within the interior of an automobile, there has been a need for an interfacing system which readily allows a cellular phone to be used through the existing radio/stereo system of an automobile.

Furthermore, in order to address the problem of a cellular phone which is adaptable to a car radio/stereo system that interferes with the use of the radio/stereo system, there has been a need for a system which is readily adaptable to the car environment and which does not interfere with the primary function(s) of the car radio/stereo when the cellular phone is not in use or is in a stand-by mode.

The use of a microphone and speaker together in a confined space often results in acoustical feed-back and, accordingly, there has also been a need for an interfacing module having echo cancellation functionality.

Still further, in order to fully enable hands-free operation of a cell phone, there has been a need for an interfacing module having voice recognition capabilities to allow activation and/or deactivation of a cellular phone through voice commands.

A review of the prior art has shown that the solution to the above problems is not taught within the prior art. For example, United States patent 5,749,057 (issued May 5, 1998) teaches a telephone had set for hands-free use in an automobile; United States patents 5,664,012 (issued September 2<sup>nd</sup>, 1997) discloses a hands-free device for a portable phone using an interface board between a hand-phone and a battery; United States patent 5,655,017 (issued August 5, 1997) discloses a portable telephone with speaker-phone to assist in hands-

free operation by a user; United States patent 5,642,402 (issued June 24, 1997) teaches hands-free equipment for mobile phones including an extra speaker and microphone; United States 5,590,414 (issued December 31, 1996) teaches an adaptor unit for a portable radio telephone which enables hands free operation; United States patent 5,588,041 (issued December 24, 1996) teaches a cellular speaker phone having a housing and a cup with hands free user interface to enable the user to operate the phone in a hands-free mode; United States patent 5,490,213 (issued February 6, 1996) teaches an apparatus for hands free operation of a cell phone within a car using a wireless microphone transmitter for generating wireless outgoing signals and a main terminal which may be connected to the cigarette lighter socket of the car; United States patent 5,487,182 (issued January 23, 1996) teaches a hands-free module for a mobile phone; and United States Patent 5,313,514 (issued May 17, 1994) teaches a hands-free apparatus for use with a mobile phone.

### ***Summary of the Invention***

In accordance with the invention and in order to address the problems described above and herein throughout this application, there is provided an interface system to enable the use of a radio transceiver through an audio equipment device (AED) having an audio output system, the interfacing system comprising:

an interface module having means for operative connection to the radio transceiver and the AED, the interface module for controlling the transfer of audio signals to and from the radio transceiver and to the audio output system of the AED.

In further embodiments of the invention, the interface module preferably includes any one of or a combination of an audio input interface and an audio output interface for operative connection to the radio transceiver, an AED output interface operatively connected to the audio input interface, the AED output interface for connecting the interface module to the AED, an AED speaker interface operatively connected to the audio input interface for operative connection to the audio output system of the AED, an amplifier operatively connected to the audio input interface for amplifying an audio output signal from the audio input interface, a microphone interface operatively connected to the audio input interface, a

call alert processor operatively connected to the audio input interface, the call alert processor for alerting a user to an incoming call when the radio transceiver is in an auto-answer mode, an echo cancellation module operatively connected to the microphone interface and the audio input interface, a voice recognition module operatively connected to the microphone interface and audio input interface, means for maintaining activation of the cell phone ring circuit when the cell phone is in a hands-free mode, and means for interfacing a peripheral device to the interface module and the interface module further includes switching means for automatically switching an input signal from the peripheral device to an input signal from the radio transceiver to the AED.

In a further embodiment of the invention the radio transceiver is operatively connected to the AED through a wireless link, preferably infra-red.

In still yet another embodiment, the invention provides an interface module for operative connection between a car radio and a cell phone to enable use of the cell phone through the car radio, the interface module comprising:

- audio input interface for receiving an audio signal from the cell phone;
- audio output interface operatively connected to the audio input interface for delivering the audio signal to an auxiliary port of the car radio;
- microphone input interface operatively connected to a microphone output interface for receiving a microphone signal from an auxiliary microphone, the microphone output interface for delivering the microphone signal to the cell phone; and,
- a call alert processor operatively connected to the audio input interface to alert a user to an incoming call.

### ***Brief Description of the Drawings***

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings wherein:

Figure 1 is a block diagram of an interfacing system between an audio equipment device (AED) and radio transceiver in accordance with the invention;

Figure 2 is a block diagram of an interfacing system where the interfacing system is configured to an AED between the AED and a speaker system;

Figure 3 is a block diagram of an interfacing system illustrating a preferred embodiment of the invention; and,

Figure 4 is a block diagram of an embodiment of the interfacing system having a wireless link.

***Detailed Description of the Invention***

With reference to the Figures, a system is provided enabling the use of a radio transceiver 12 through an audio equipment device (AED) 14. Generally, an AED 14 is a device having a primary audio function which, in accordance with the invention, may be adapted to provide radio communication capabilities through the device. An AED may include but is not limited to devices such as personal computers, including desktop and portable devices, portable phones, radios including car radios, home entertainment systems and portable radios, portable compact disk or cassette players, televisions, fax machines, answering machines, portable messaging devices and video cameras.

In order to expand upon the primary functionality of an AED, the invention generally provides an interfacing system wherein an AED having audio output speakers may be used to enable the use of a radio transceiver device 12 through the audio output system of the AED.

More particularly, the system includes an interface module 52 which may be configured to both the AED 14 and radio transceiver 12. For the purposes of illustration, the system is described herein with reference to a radio transceiver device such as a cellular telephone operable through a car radio. In this particular embodiment, the system provides a "hands-free" operating mode to a cellular phone user in an automobile. It is understood that other AED's may utilize the interface module herein described.

***AED 14***

In order to function in accordance with the invention, an AED has:

1. A primary functionality such as radio receiving, cassette or CD playing, video output or other consumer electronics functionality;
2. An audio output system 20; and,
3. Optionally, an auxiliary input port 16 allowing the connection of peripheral devices 18 to the AED and an auxiliary port selector 22 to select the auxiliary input.

***Interface Module 52***

With particular reference to Figures 1 and 2, the interface module 52 has:



1. Power input interface 54 to receive power from an external power supply 54a. Alternatively, the interface module may have an internal battery (not shown);
2. Power output interface 1 to deliver power to the radio transceiver 12 (Alternatively, the cell phone 12 may receive power from on-board batteries or another power supply, not shown);
3. Microphone input interface 56 to receive audio output from a microphone 58 to the interface module 52;
4. Audio output 60 interface to deliver audio signals from the interface module 52 to the AED 14 (Figure 1) or AED speakers 20 (Figure 2);
5. Audio input interface 62 to receive audio signal from the radio transceiver 12 to the interface module 52;
6. Microphone output interface 64 to deliver a microphone input signal from the interface module 52 to the cell phone 12;

With particular reference to Figure 1, the interface module 52 may also include ringer input interface 66 to receive an activate ringer signal from the cell phone 12, a call alert processor 68 which provides an audio output ring signal and an echo cancellation processor 69 to provide echo cancellation functionality between the microphone 58 and AED speaker output 20. Echo cancellation functionality will be required with the use of various AED's in order to limit the effect of acoustic feedback between speakers and microphones. That is, echo cancellation functionality will be required in order to permit operation of both a microphone and speakers within an open space or room (that is, during duplex communication). In particular, echo cancellation functionality will be required for any AED which does not necessarily require the use of a head set such as a car radio, portable radio, computer, portable cassette or CD player or video camera. In each case, a jack for the use of a headset may be provided on the AED but in each case the use of echo cancellation technology would enhance the functionality of the AED.

In the embodiment shown in Figure 2 and with further reference to Figure 3, the interface module 52 includes a switching device 105 to provide control over audio output 60. Switching device 105 reacts to input 66 received from the transceiver 12 through the

transceiver interface 62. In addition, an amplifier 106 may be provided to provide power for transceiver audio output when said output is directed to 20 by 105.

The interface module 52 may also optionally include a voice recognition module 107 which controls switching device 105 and/or activation of the transceiver 12 for initiation of a call by the user or for answering an incoming call.

The interface module 52 will also preferably include echo cancellation means 109 as described above wherein the echo cancellation means receives audio input from the microphone 58 and audio input from transceiver 12.

In the situation where the AED 12 is a car radio having an auxiliary interface 16, the interface module 52 may be attached between the car radio 14 and another peripheral device 18 such as a CD player 18 as shown in Figure 1. In this case, the interface module may be provided with an appropriate switching device and/or processor 72 to disconnect the peripheral device 18 from the AED if an outgoing call is initiated or an incoming call is detected.

The interface module 52 will be preferably designed as a retro-fit product in kit form which allows a user to connect a radio transceiver to an AED through integrated interfaces. The retro-fit kit may permit simple connection by a user or require installation by a technician.

### ***Radio Transceiver/Cell Phone 12***

In accordance with the invention, the radio transceiver/cell phone 12 has:

1. Audio input interface 64a to receive audio input signals from the interface module 52
2. Audio output interface 62a to provide audio output signals from the radio transceiver 12 to the interface module 52; and optionally,
3. Power connection 70 to receive power from the interface module or other power supply;
4. Ringer output interface 66a to provide a ring signal to the call alert processor 68

of the interface module 52.

In a typical cell phone 12, the cell phone includes a hands-free interface at the base of the cell phone to allow auxiliary microphones/speakers to be attached to the cell phone if hands-free operation is desired. Upon connection of a cable into the hands-free interface, the ringer of the cell phone may be suppressed to allow ringing through auxiliary speakers.

It is envisaged that in order to allow operation of the AED with its primary functionality, the interface module may include a processor which does not suppress the ringer of the cell phone if a hands-free connection is made.

### ***Microphone 58***

The microphone 58 has a interface to provide an audio input signal to the interface module 52. Preferably, the microphone 58 will be adapted to provide convenience to the user. For example, the microphone may be a standard microphone headset or a microphone adapted to be attached to a location in vehicle such as the sun visor or another suitable location.

### ***Operation of the system***

#### ***Connection of the Interface Module to the AED***

In the embodiment shown in Figure 1, the interface module is preferably connected directly with the socket power supply of an automobile which has been adapted to include an auxiliary port interface hardwired to the auxiliary input port 16 of the car radio 14. In this form, the user fully connects the interface module 52 to the AED with a single interface. In other embodiments, with different AED's, the interface module may make separate connections to the AED auxiliary input port and power supply. Similarly, for the embodiment shown in Figure 2, a single or multiple connection system may be utilized to connect the interface module 52 between the AED and speaker system 20.

In the preferred embodiment of a car radio, the interface module 52 may be attached to the car radio within the dash-board wherein an appropriate connection cord from the interface module 52 exits the dash-board to allow connection of the cell phone 12 to the interface

module 52.

### ***Incoming Call***

After connection of the interface module 52 to the AED 14, the user is free to use the primary functionality of the AED such as listening to radio stations, playing a cassette tape or CD. If the cell phone receives an incoming call, the ringer in the interface module 52 may be activated alerting the user of an incoming call or, alternatively, the cell phone rings as it would normally. The user, upon hearing the ringer, activates the auxiliary selector 22 (Figure 1), thereby stopping or interrupting the AED's primary functions. Through activation of the auxiliary selector 22, audio output signals from the cell phone 12 are transferred from the cell phone 12 to the audio output system 20 of the AED 14.

Preferably, the user has placed the cell phone in an auto answer mode to enable the user to take the call by depressing a single button, that is the auxiliary selector.

In the event that the cell phone is not placed in an auto answer mode, the user would have to activate the call at the cell phone 12 as well as at through the auxiliary selector 22.

In the embodiment shown in Figure 2, an incoming call signal is delivered to the switch 105 and, optionally a voice recognition module, if present. The switch 105 causes the ringer to be broadcast through speakers 20 and the user can activate the call either through activation of the cell phone or through a command recognized by voice recognition system 107.

### ***Outgoing Call***

In making an outgoing call, the user would stop use of the primary functionality of the AED by activation of the auxiliary selector 22 (Figure 1). The user would then use the cell phone in the regular manner to place the call using the input system of the cell phone.

In the embodiment shown in Figure 2, the system may be activated through a command issued to the voice recognition system 107 or through manual activation of the cell phone.

As indicated above, it is envisaged that an interface module 52 may be used to connect a cell phone to other AED's such as portable radios, televisions, video cameras etc. Furthermore, the radio transceiver may include other two-way radio transmission devices.

In a still further embodiment, the connection between the AED and radio transceiver may be a wireless connection such as an IR link as shown in Figure 4. In this embodiment, a wireless module 100a and 100b, respectively, would be attached to both the AED 14 and transceiver 12 to provide two-way communication. Functionality of the interface module 52 as described above would be incorporated within the wireless module 100a. In an embodiment where the wireless modules are IR based, operation of the system would require line-of-sight orientation of the respective IR modules.

The terms and expressions which have been employed in this specification are used as terms of description and not of limitations, and there is no intention in the use of such terms and expressions to exclude any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the claims.

**WHAT IS CLAIMED IS:**

1. An interface system to enable the use of a radio transceiver through an audio equipment device (AED) having an audio output system, the interfacing system comprising:  
an interface module having means for operative connection to the radio transceiver and the AED, the interface module for controlling the transfer of audio signals to and from the radio transceiver and to the audio output system of the AED.
2. The interface system as in claim 1 wherein the interface module includes an audio input interface and an audio output interface for operative connection to the radio transceiver.
3. The interface system as in any one of claims 1-2 wherein the interface module further includes an AED output interface operatively connected to the audio input interface, the AED output interface for connecting the interface module to the AED.
4. The interface system as in any one of claims 1-3 wherein the interface module includes an AED speaker interface operatively connected to the audio input interface for operative connection to the audio output system of the AED.
5. The interface system as in any one of claims 1-4 wherein the interface module further includes an amplifier operatively connected to the audio input interface for amplifying an audio output signal from the audio input interface.
6. The interface system as in any one of claims 1-5 wherein the interface module includes a microphone interface operatively connected to the audio input interface.
7. The interface system as in any one of claims 1-6 wherein the interface module includes a call alert processor operatively connected to the audio input interface, the call alert processor for alerting a user to an incoming call when the radio transceiver is in an auto-answer mode.
8. The interface system as in any one of claims 1-7 wherein the interface module includes

an echo cancellation module operatively connected to the microphone interface and the audio input interface.

9. The interface system as in any one of claims 1-8 wherein the interface module includes a voice recognition module operatively connected to the microphone interface and audio input interface.

10. The interface system as in any one of claims 1-9 wherein the interface module includes means for maintaining activation of the cell phone ring circuit when the cell phone is in a hands-free mode.

11. The interface system as in claim 2 wherein the interface module includes means for interfacing a peripheral device to the interface module and the interface module further includes switching means for automatically switching an input signal from the peripheral device to an input signal from the radio transceiver to the AED.

12. The interface system as in claim 1 wherein the radio transceiver is operatively connected to the AED through a wireless link.

13. The interface system as in claim 12 wherein the wireless link is infra-red.

14. An interface module for operative connection between a car radio and a cell phone to enable use of the cell phone through the car radio, the interface module comprising:

- audio input interface for receiving an audio signal from the cell phone;
- audio output interface operatively connected to the audio input interface for delivering the audio signal to an auxiliary port of the car radio;
- microphone input interface operatively connected to a microphone output interface for receiving a microphone signal from an auxiliary microphone, the microphone output interface for delivering the microphone signal to the cell phone; and,
- a call alert processor operatively connected to the audio input interface to alert a user to an incoming call.

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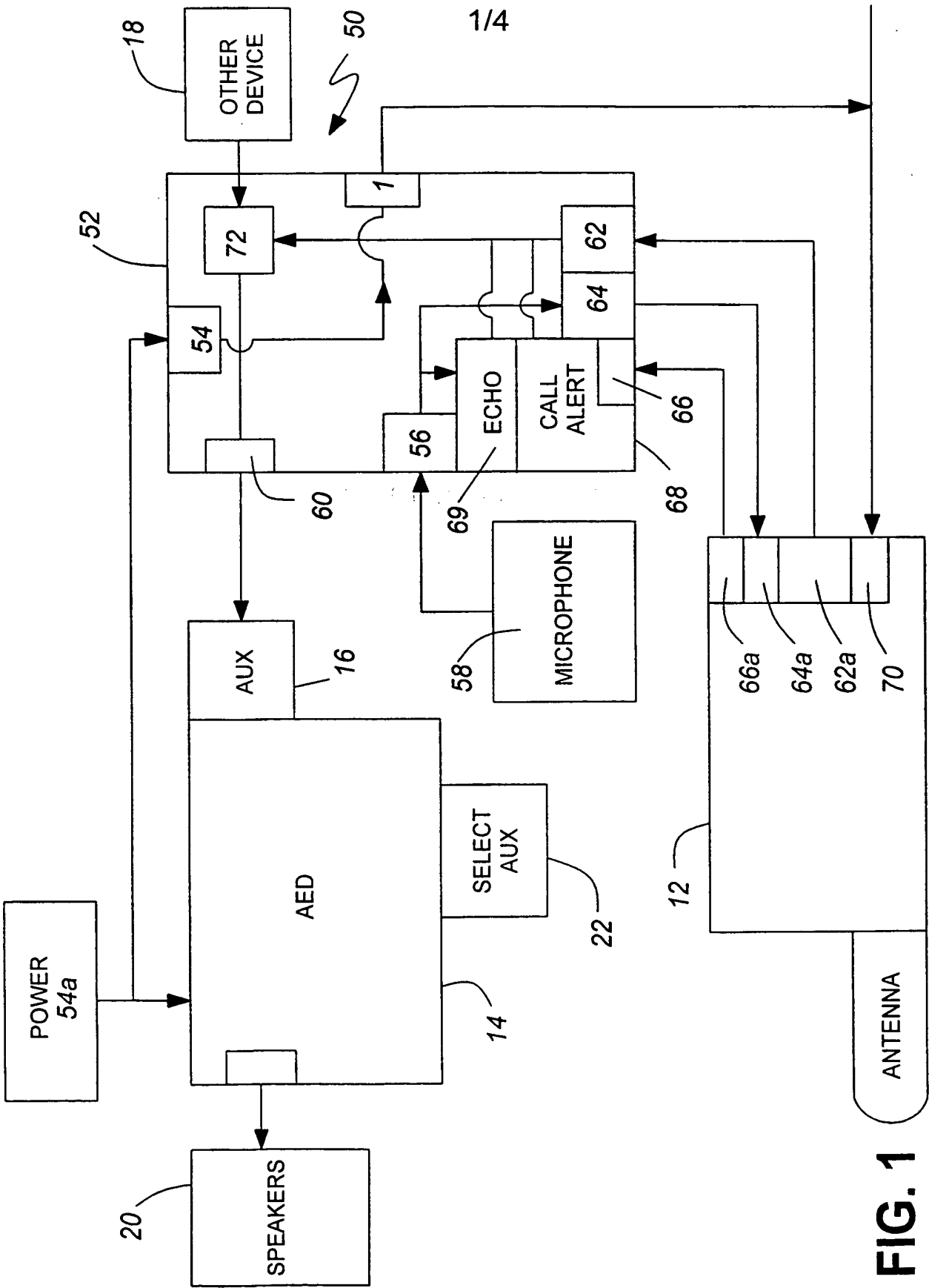


FIG. 1

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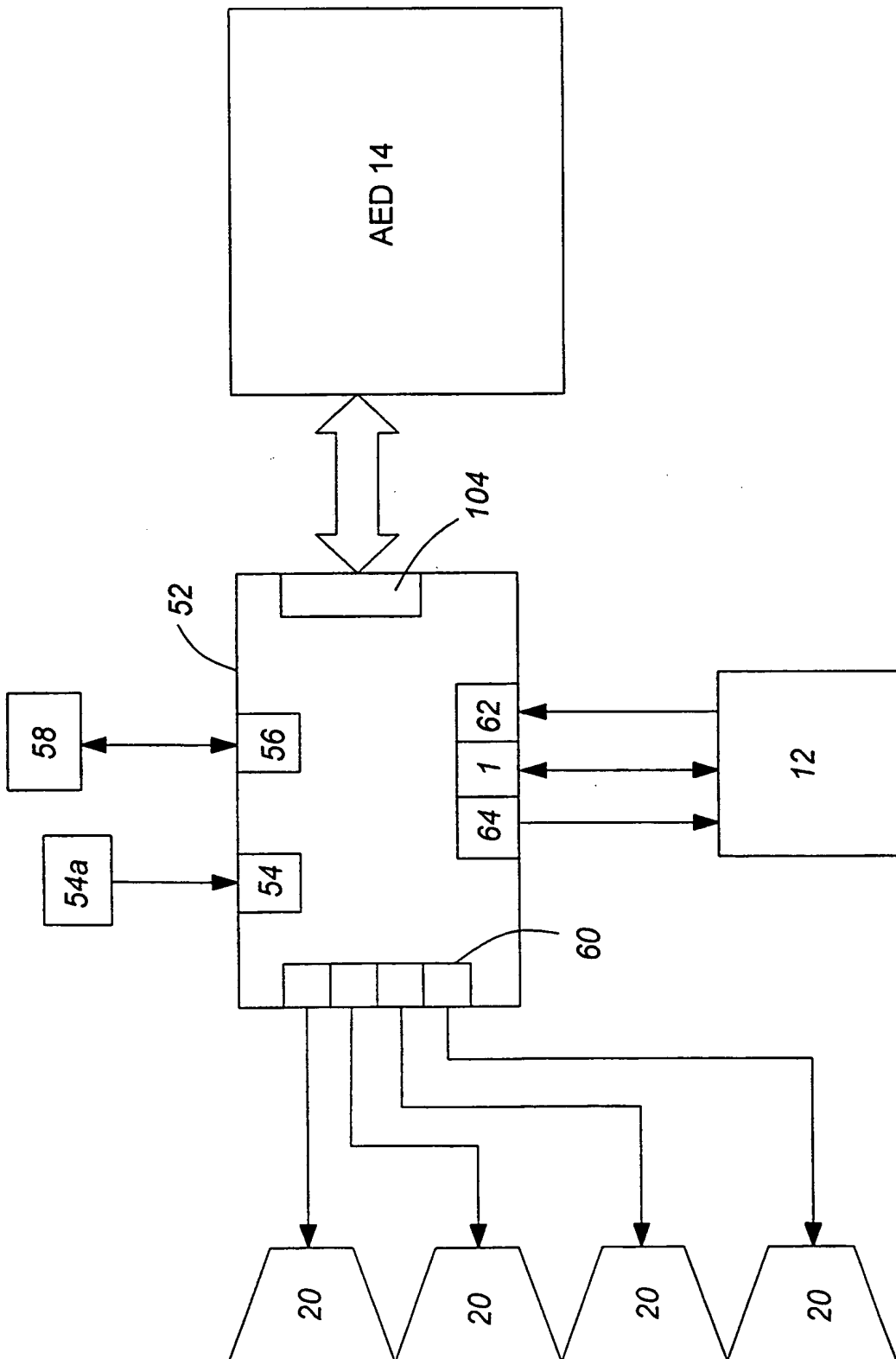


FIG. 2

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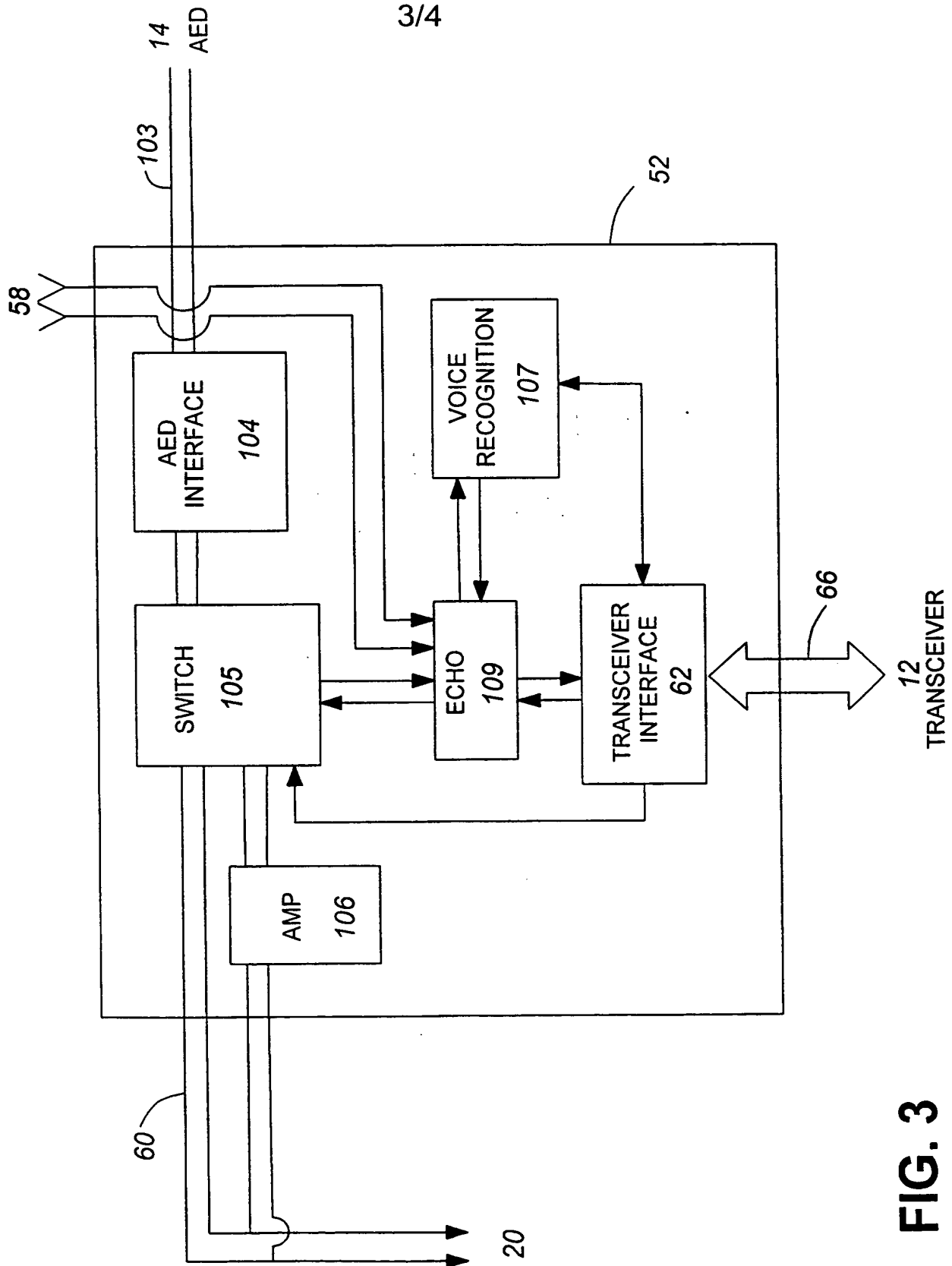


FIG. 3

# INTERNATIONAL SEARCH REPORT

Int. national Application No

PCT/CA 99/00720

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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